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Passage of ions and pick-up ions over the diamagnetic solar wind termination shock

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Ions and electrons generate magnetic moments in a magnetized plasma due to their gyrations around the local plasma. These moments are always oriented antiparallel to the acting background field and add up to a local diamagnetic moment per unit volume which then partly compensates the background vacuum magnetic field strength. Taking this diamagnetic effect into account we derive relations for the magnetic field induction of a pick-up ion loaded solar wind at large heliospheric distances and show that the magnetic induction falls off faster with distance as predicted by Parker‘s Archimedian field theory, a phenomenon already recognized and termed as a magnetic flux deficit. This diamagnetic effect becomes especially interesting at MHD shocks like the solar wind termination shock. The shocked and strongly heated ion plasma downstream of this shock due to its diamagnetic action compensates for a part of the expected downstream magnetic fields reducing the classically expected magnetic compression values by substantial amounts. We shall analyse consequences of that diamagnetic shock for the downstream pick-up ion spectra.